Appendix 1: Primary codes used for severe sepsis

Septicemia	038.0, 038.10, 038.11, 038.19, 038.2, 038.3, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9
Bacteremia	790.7
Disseminated fungal infection	117.9
Disseminated candidal infection	112.5
Candidal endocarditis	112.81
Fungal endocarditis	115.04, 115.14, 115.94
Salmonella septicemia	003.1
Septicemic plague	020.2
Anthrax septicemia	022.3
Meningococcal septicemia	036.2
Waterhouse Friedrichson syndrome	036.3
Gonococcemia	098.89
Sepsis due to indwelling catheter	996.62
SIRS due to infectious process with organ failure=severe sepsis	995.92
Septic shock	785.52

Appendix 2 - Classification of acute organ failure

Organ Failure	ICD-9-CM codes	Description
Respiratory	518.81	Acute respiratory failure
	518.82	Other pulmonary insufficiency, not elsewhere classified includes - Acute respiratory distress Acute respiratory insufficiency Adult respiratory distress syndrome NEC
	518.85	ARDS after shock or trauma
	786.09	respiratory distress NOS
	791.1	Respiratory arrest
	96.7	Ventilator management
Cardiovascular		
	785.5	Shock without mention of trauma
	785.50	Shock unspecified
	785.51	Cardiogenic shock
	785.52	Septic shock
	785.59	Other shock without trauma (includes Hypovolemic Shock)
	458.8,458.9,796.3	Hypotension NOS
	00.17	Use of vasopressor agent
Renal	584	Acute kidney injury
Hepatic	570	Acute hepatic failure or necrosis
	572.2	Hepatic encephalopathy
	573.4	Hepatic infarction
Hematologic	286.6	Defibrination syndrome
	286.7	Acquired coagulation factor deficiency
	286.9	Coagulopathy = "Other and unspecified coagulation defects"
	287.4, 287.5	Thrombocytopenia - secondary or unspecified
Metabolic	276.2	Acidosis - metabolic or lactic
Neurologic	293	Transient organic psychosis
	348.1	Anoxic brain injury
	348.3	Acute encephalopathy
	780.01	Coma
	780.09	Altered consciousness - unspecified
	89.14	EEG

Appendix 3: Patient co-morbidities & procedures

Excluded ESRD & transplant patients	
End Stage Renal Disease	*585.6 (585 before 2005), 39.95, V56.0-3, V45.1x, V56.2,V56.8*
Transplants	*Kidney: V42.0. 996.81,* *Heart: V42.1, 996.83,* *Lungs: V42.6, 996.84,* *Liver: V42.7, 996.82* *Stem cell: V42.82* *BMT V42.81, 996.85* *Others: V42.84, V42.89,V42.9*
Co-morbidities used in Charlson-Deyo's index	
Coronary artery disease	410-414
Congestive Heart Failure	428
Stroke	431-437
Chronic Pulmonary Disease (COPD, asthma, ILD, bronchiectasis)	490- 496,500-505
Cirrhosis	571.2,571.5-9, 275.0, 275.1, 39.1, 572.4, 572.2, 456.2, 567.23
Peripheral vascular disease	440,441,785.4,443.1,443.9
Diabetes Mellitus	250.xx
Chronic kidney disease	585.1-585.5,585.9
Cancer without metastasis	140-175, 179-195
Cancer with metastasis	196-199
Lymphoma and leukemia	200-208
Human Immunodeficiency Virus	042, 079.53, V08
Rheumatologic and Collagen vascular diseases	710,714,720
Paralysis	342,344
Co-morbidities associated with outcomes in severe sepsis but not included in Charlson-Deyo's index	
Atrial fibrillation	427.31
Morbid obesity	278.01, V85.4
Immunodeficiency	279
Malnutrition	260-269
Procedures	
Mechanical ventilation	96.70-2
Blood transfusion	99.03, 99.04
Swan Ganz catheterization	37.21
Central line placement	38.93, 89.62
Tracheostomy	31.1, 31.2,31.21,31.29
Total parenteral nutrition	99.15
New dialysis	Acute kidney injury & hemodialysis
Hemodialysis	39.95
Acute kidney injury	584.5-584.9

Appendix 4: Predictors of mortality in severe sepsis using multivariate logistic regression analysis

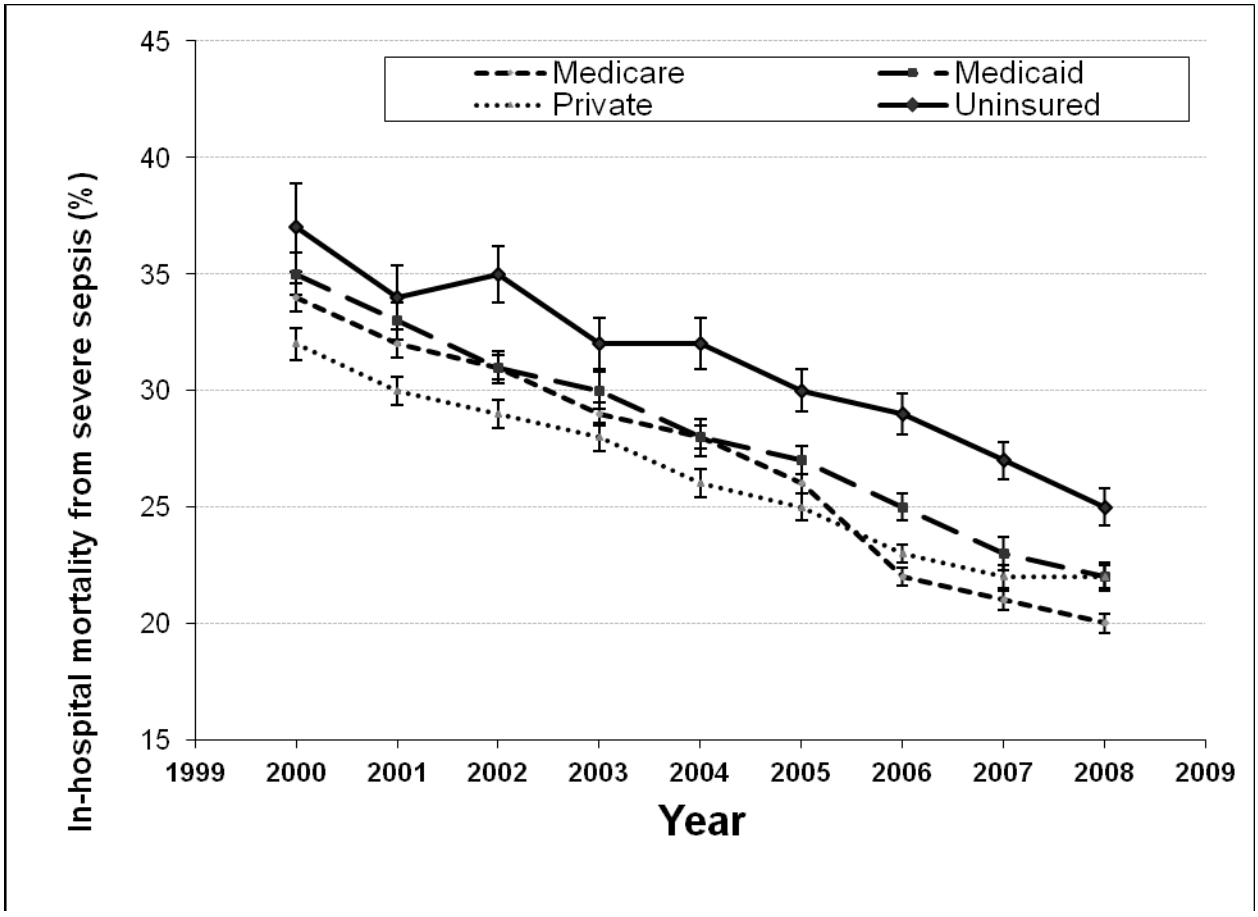
Variables	Odds ratio (95% Confidence interval)
Uninsured	Reference
Private	
Organ failures: 1	0.75 (0.70-0.80)
2	0.71 (0.67-0.76)
3	0.61 (0.56-0.67)
4	0.62 (0.55-0.71)
5	0.54 (0.43-0.68)
6	0.33 (0.18-0.61)
Medicare	
Organ failures: 1	1.00 (0.93-1.07)
2	0.82 (0.77-0.89)
3	0.71 (0.65-0.77)
4	0.71 (0.61-0.81)
5	0.55 (0.42-0.71)
6	0.55 (0.28-1.08)
Medicaid	
Organ failures: 1	0.89 (0.83-0.96)
2	0.82 (0.76-0.88)
3	0.74 (0.68-0.81)
4	0.76 (0.66-0.87)
5	0.67 (0.53-0.86)
6	0.51 (0.27-0.95)
Others	
Organ failures: 1	0.81 (0.73-0.89)
2	0.78 (0.71-0.86)
3	0.64 (0.56-0.72)
4	0.74 (0.62-0.89)
5	0.59 (0.43-0.82)
6	1.37 (0.52-3.58)
Age category	
18-24	Reference
25-34	1.14(1.05-1.23)
35-44	1.27(1.18-1.37)
45-54	1.42(1.31-1.55)
55-64	1.68(1.51-1.85)
Sex	
Male	Reference
Female	0.96(0.93-0.98)
Race	
Whites	Reference
Blacks	1.13(1.09-1.18)
Hispanics	1.09(1.04-1.15)

Asians	1.02(0.94-1.12)
Native Americans	1.04(0.89-1.23)
Others	1.07(0.99-1.15)
Unknown	1.03(0.97-1.09)
Annual Zip income	
1-38,999	Reference
39,000-47,999	0.92(0.89-0.96)
48,000-62,999	0.86(0.82-0.90)
≥63,000	0.84(0.80-0.88)
Admission source , (%)	
From emergency room	reference
Transfer from other hospitals	1.06(0.99-1.14)
From nursing homes	1.00(0.91-1.09)
Law/Others	1.30(0.88-1.91)
Hospital Characteristics, (%)	
Non-Teaching	Reference
Teaching	1.06(1.01-1.11)
Small	Reference
Medium	1.06(1.00-1.13)
Large	1.07(1.01-1.14)
Hospital ownership, (%)	
Government - Non federal	Reference
Private - Non Profit	0.91(0.85-0.97)
Private - Investor owned	0.95(0.88-1.03)
Number of Organ System Failures	
One	Reference
Two	2.28(2.09-2.49)
Three	4.39(3.95-4.88)
Four	6.28(5.50-7.1)
Five	10.3(8.33-12.9)
Six/Seven	16.2(9.34-28.2)
Co-morbidities	
Coronary Artery Disease	1.15(1.11-1.19)
Congestive heart failure	1.06(1.03-1.10)
Atrial fibrillation	1.25(1.20-1.30)
Diabetes mellitus	0.81(0.79-0.84)
BMI≥40	0.94(0.89-1.01)
Peripheral vascular disease	1.34(1.27-1.41)
Stroke	1.75(1.66-1.85)
Paralysis	0.79(0.74-0.84)
Chronic lung disease	0.95(0.92-0.97)
Cirrhosis	2.29(2.21-2.37)
Chronic Kidney Disease	0.98(0.93-1.03)
HIV infection	2.25(2.13-2.38)
Rheumatologic and Collagen	1.34(1.26-1.42)

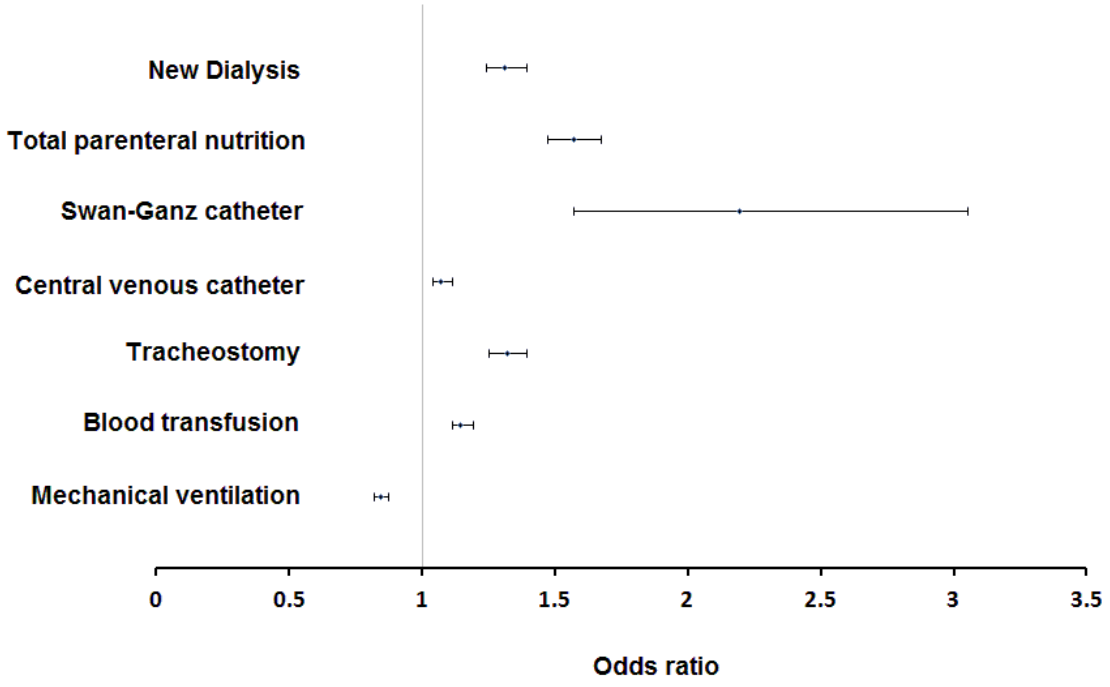
vascular diseases	
Immunodeficiency	0.94(0.75-1.17)
Malnutrition	0.93(0.89-0.97)
Cancer without metastasis	1.92(1.83-2.01)
Cancer with metastasis	3.37(3.21-3.54)
Lymphoma and leukemia	2.93(2.77-3.09)
Year	
2000	Reference
2001	0.90(0.84-0.96)
2002	0.82(0.76-0.87)
2003	0.74(0.69-0.79)
2004	0.66(0.61-0.71)
2005	0.60(0.56-0.64)
2006	0.52(0.49-0.56)
2007	0.44(0.41-0.47)
2008	0.41(0.38-0.45)
Procedures (%)	
Invasive mechanical ventilation	3.01(2.92-3.11)
Blood transfusions	0.93(0.90-0.96)
Tracheostomy	0.58(0.55-0.61)
Central venous catheter	0.89(0.87-0.91)
Swan-Ganz catheter	1.47(1.21-1.79)
Total parenteral nutrition	0.97(0.92-1.01)
New Dialysis	1.22(1.17-1.28)

* Significant at $p<0.05$

Appendix 5: Mortality rates in severe sepsis between ages 18 – 64 years, 2000-2008. Bars represent standard error of the mean.



Appendix 6. Forrest plot showing adjusted odds ratio of undergoing procedure*. Comparison of private vs. uninsured. Model adjusted for age, gender, race, severity of sepsis, Charlson-Deyo's co-morbid index, teaching hospital and hospital ownership.



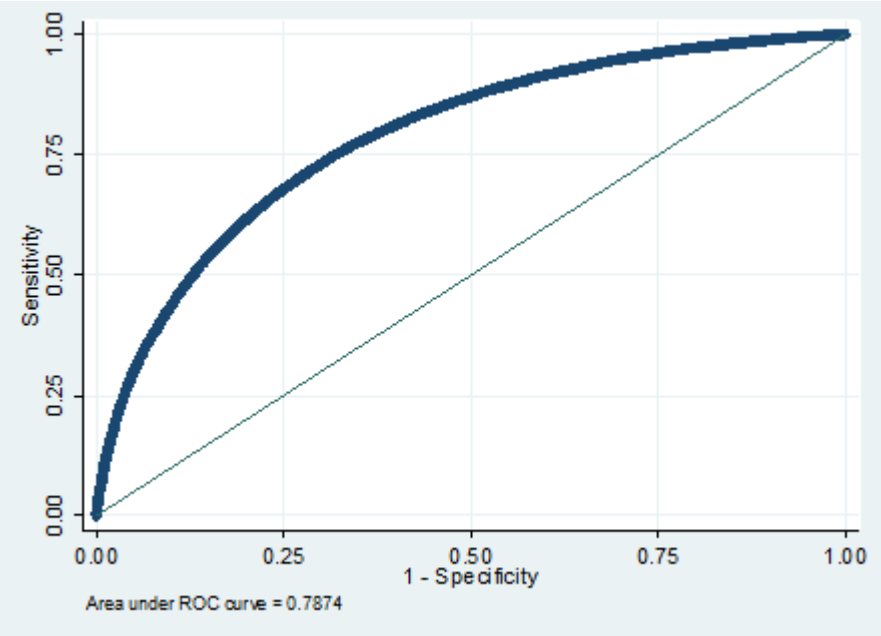
*

Appendix 7: Adjusted difference in length of stay and odds of being discharged to nursing home or with home care^.

Variables	Adjusted relative increase in length of stay (95% CI)	Adjusted odds of being discharged to nursing home (95% CI)	Adjusted odds of being discharged with home care (95% CI)
Payer			
Uninsured	Reference	Reference	Reference
Private*	1.05(1.03-1.08)	2.06(1.97-2.16)	2.64(2.50-2.78)
Medicare*	1.05(1.03-1.08)	5.31(5.06-5.56)	3.31(3.13-3.51)
Medicaid*	1.19(1.17-1.21)	3.81(3.64-4.00)	2.54(2.40-2.69)
Others*	1.10(1.08-1.15)	1.61(1.51-1.71)	1.51(1.41-1.63)

^ The regression was adjusted for age, gender, race, Charlson-Deyo's index and number of organ dysfunction.
* $p<0.05$

Appendix 8: ROC curve for the model D



Goodness of fit

chi square/df = 1.11

estat gof , table group (500)

Logistic model for died, goodness-of-fit test

number of observations = 260365
number of groups = 500
Hosmer-Lemeshow chi2(498) = 551.06
Prob > chi2 = 0.0499

Collinearity Diagnostics

_Ipay1_1 : 1= PRIVATE, 0 = EVERYTHING ELSE
_Ipay1_2 : 1= MEDICARE, 0 = EVERYTHING ELSE
_Ipay1_3 : 1= MEDICAID, 0 = EVERYTHING ELSE
_Ipay1_5 : 1= OTHERS, 0 = EVERYTHING ELSE

Variable	VIF	SQRT VIF	Tolerance	R-Squared
_Ipay1_1	1.12	1.06	0.8955	0.1045
agegroup	1.15	1.07	0.8708	0.1292
sex	1.04	1.02	0.9584	0.0416
race	1.03	1.02	0.9676	0.0324
zipinc_qrtl	1.11	1.05	0.9029	0.0971

asource	1.04	1.02	0.9658	0.0342
hosp_teach	1.10	1.05	0.9100	0.0900
h_contrl	1.09	1.04	0.9164	0.0836
hosp_bedsize	1.03	1.01	0.9726	0.0274
year	1.10	1.05	0.9087	0.0913
ORGAN_DYSFN	1.34	1.16	0.7454	0.2546
cad	1.09	1.05	0.9142	0.0858
chf	1.12	1.06	0.8913	0.1087
stroke	1.03	1.01	0.9735	0.0265
chr_lung_dz	1.10	1.05	0.9116	0.0884
cirrhosis	1.07	1.04	0.9324	0.0676
dm	1.09	1.04	0.9187	0.0813
pvd	1.03	1.01	0.9743	0.0257
mobese	1.03	1.01	0.9749	0.0251
ckd	1.04	1.02	0.9624	0.0376
solid_cancer	1.48	1.22	0.6748	0.3252
mets	1.49	1.22	0.6727	0.3273
blood_cancer	1.05	1.03	0.9484	0.0516
hiv	1.06	1.03	0.9448	0.0552
col_vd	1.02	1.01	0.9795	0.0205
paralysis	1.04	1.02	0.9605	0.0395
afib	1.06	1.03	0.9474	0.0526
immunodef	1.00	1.00	0.9977	0.0023
malnutrition	1.04	1.02	0.9623	0.0377
mech_vent	1.36	1.17	0.7365	0.2635
trach	1.09	1.04	0.9170	0.0830
cvp	1.08	1.04	0.9228	0.0772
rhc	1.01	1.00	0.9925	0.0075
blood	1.07	1.04	0.9307	0.0693
tpn	1.06	1.03	0.9397	0.0603
new_dialysis	1.09	1.04	0.9204	0.0796
Mean VIF	1.10			

Variable	VIF	SQRT VIF	Tolerance	R-Squared
_Ipay1_2	1.06	1.03	0.9398	0.0602
agegroup	1.16	1.08	0.8586	0.1414
sex	1.04	1.02	0.9579	0.0421
race	1.03	1.02	0.9674	0.0326
zipinc_qrtl	1.06	1.03	0.9438	0.0562
asource	1.03	1.01	0.9708	0.0292
hosp_teach	1.10	1.05	0.9094	0.0906
h_contrl	1.09	1.04	0.9186	0.0814
hosp_bedsize	1.03	1.01	0.9729	0.0271
year	1.10	1.05	0.9087	0.0913
ORGAN_DYSFN	1.34	1.16	0.7452	0.2548
cad	1.09	1.05	0.9143	0.0857
chf	1.12	1.06	0.8906	0.1094

stroke	1.03	1.01	0.9728	0.0272
chr_lung_dz	1.10	1.05	0.9123	0.0877
cirrhosis	1.07	1.04	0.9320	0.0680
dm	1.09	1.04	0.9191	0.0809
pvd	1.03	1.01	0.9743	0.0257
mobese	1.03	1.01	0.9750	0.0250
ckd	1.04	1.02	0.9617	0.0383
solid_cancer	1.48	1.22	0.6745	0.3255
mets	1.48	1.22	0.6737	0.3263
blood_cancer	1.05	1.03	0.9514	0.0486
hiv	1.05	1.03	0.9493	0.0507
col_vd	1.02	1.01	0.9789	0.0211
paralysis	1.04	1.02	0.9585	0.0415
afib	1.06	1.03	0.9476	0.0524
immunodef	1.00	1.00	0.9978	0.0022
malnutrition	1.04	1.02	0.9624	0.0376
mech_vent	1.36	1.17	0.7368	0.2632
trach	1.09	1.04	0.9170	0.0830
cvp	1.08	1.04	0.9227	0.0773
rhc	1.01	1.00	0.9925	0.0075
blood	1.07	1.04	0.9309	0.0691
tpn	1.06	1.03	0.9408	0.0592
new_dialysis	1.09	1.04	0.9204	0.0796

Mean VIF	1.10

Variable	VIF	SQRT VIF	Tolerance	R-Squared
_Ipay1_3	1.07	1.03	0.9354	0.0646
agegroup	1.16	1.08	0.8594	0.1406
sex	1.05	1.02	0.9553	0.0447
race	1.03	1.02	0.9672	0.0328
zipinc_qrtl	1.08	1.04	0.9270	0.0730
asource	1.03	1.02	0.9690	0.0310
hosp_teach	1.10	1.05	0.9099	0.0901
h_contrl	1.09	1.04	0.9184	0.0816
hosp_bedsize	1.03	1.01	0.9731	0.0269
year	1.10	1.05	0.9084	0.0916
ORGAN_DYSFN	1.34	1.16	0.7454	0.2546
cad	1.09	1.05	0.9143	0.0857
chf	1.12	1.06	0.8921	0.1079
stroke	1.03	1.01	0.9736	0.0264
chr_lung_dz	1.09	1.05	0.9157	0.0843
cirrhosis	1.07	1.04	0.9305	0.0695
dm	1.09	1.04	0.9189	0.0811
pvd	1.03	1.01	0.9744	0.0256
mobese	1.03	1.01	0.9750	0.0250
ckd	1.04	1.02	0.9628	0.0372
solid_cancer	1.48	1.22	0.6754	0.3246
mets	1.48	1.22	0.6745	0.3255

blood_cancer	1.05	1.02	0.9530	0.0470
hiv	1.06	1.03	0.9437	0.0563
col_vd	1.02	1.01	0.9792	0.0208
paralysis	1.04	1.02	0.9633	0.0367
afib	1.06	1.03	0.9475	0.0525
immunodef	1.00	1.00	0.9977	0.0023
malnutrition	1.04	1.02	0.9623	0.0377
mech_vent	1.36	1.17	0.7366	0.2634
trach	1.09	1.04	0.9172	0.0828
cvp	1.08	1.04	0.9230	0.0770
rhc	1.01	1.00	0.9925	0.0075
blood	1.08	1.04	0.9301	0.0699
tpn	1.06	1.03	0.9406	0.0594
new_dialysis	1.09	1.04	0.9204	0.0796

Mean VIF 1.10

Variable	VIF	SQRT VIF	Tolerance	R-Squared
_Ipay1_5	1.01	1.00	0.9904	0.0096
agegroup	1.15	1.07	0.8729	0.1271
sex	1.05	1.02	0.9566	0.0434
race	1.03	1.02	0.9676	0.0324
zipinc_qrtl	1.06	1.03	0.9462	0.0538
asource	1.03	1.01	0.9708	0.0292
hosp_teach	1.10	1.05	0.9106	0.0894
h_contrl	1.09	1.04	0.9171	0.0829
hosp_bedsize	1.03	1.01	0.9731	0.0269
year	1.10	1.05	0.9081	0.0919
ORGAN_DYSFN	1.34	1.16	0.7454	0.2546
cad	1.09	1.05	0.9143	0.0857
chf	1.12	1.06	0.8920	0.1080
stroke	1.03	1.01	0.9736	0.0264
chr_lung_dz	1.09	1.04	0.9168	0.0832
cirrhosis	1.07	1.04	0.9331	0.0669
dm	1.09	1.04	0.9194	0.0806
pvd	1.03	1.01	0.9744	0.0256
mobese	1.03	1.01	0.9749	0.0251
ckd	1.04	1.02	0.9628	0.0372
solid_cancer	1.48	1.22	0.6755	0.3245
mets	1.48	1.22	0.6745	0.3255
blood_cancer	1.05	1.02	0.9529	0.0471
hiv	1.05	1.03	0.9494	0.0506
col_vd	1.02	1.01	0.9795	0.0205
paralysis	1.04	1.02	0.9638	0.0362
afib	1.06	1.03	0.9476	0.0524
immunodef	1.00	1.00	0.9978	0.0022
malnutrition	1.04	1.02	0.9624	0.0376
mech_vent	1.36	1.16	0.7368	0.2632
trach	1.09	1.04	0.9173	0.0827

cvp	1.08	1.04	0.9230	0.0770
rhc	1.01	1.00	0.9925	0.0075
blood	1.07	1.04	0.9309	0.0691
tpn	1.06	1.03	0.9409	0.0591
new_dialysis	1.09	1.04	0.9204	0.0796

Mean VIF 1.10